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Physiological plant anatomy

An English translation of the fourth edition of HABERLANDT'S *Physiologische Pflanzenanatomie*[3] will be welcomed by all who have been engaged in the study and teaching of this particular phase of the science, particularly as it will make the investigations of this leader in physiological anatomy more readily available for students. As pointed out by the translator, the latest German edition, recently reviewed in this journal,[4] may be assumed to embody the mature and considered views of its author with regard to this section of botanical science. In the chapter on sense organs, in particular, there is much original data, now appearing for the first time in English. Here no one will question the facts presented, although many will object to the teleological interpretations given by HABERLANDT.

The translator seems to have done his work very well, at times using considerable freedom to obtain a desirable clearness of expression quite in keeping with the meaning of the original. The volume is well printed in a most legible type, and all the illustrations, notes, and bibliography of the German edition are retained. One might sometimes wish, however, for complete citations of the literature.—GEO. D. FULLER.

MINOR NOTICES

A northwestern manual.—FRYE and RIGG[5] have prepared a manual for the use of schools of Oregon, Idaho, Washington, and the coastal region of southwestern British Columbia. These special manuals for relatively restricted regions are very useful for schools, since the keys can be made much more direct and simple, and the descriptions can be fitted more closely to the local conditions than is possible in manuals that cover a large area. The book is well organized, with every device for easy use, and should prove well adapted to its purpose. The real test of a manual lies in its use, and the reviewer cannot estimate this one from such a standpoint, but he has every reason to believe that the long experience of the authors in the region covered has enabled them to fit the work exactly to its purpose.—J. M. C.

Plantae Wilsonianae.—SARGENT[6] in co-operation with several specialists has recently issued, as a fourth part of *Plantae Wilsonianae*, another important contribution to our knowledge of the flora of China. The present part, like the preceding ones, is based primarily on a critical study of plants collected in western China by E. H. WILSON, but it includes also citations of collections made by HENRY, FAURIE, JACK, PURDOM, SARGENT, TAQUET, and others. Upward of 100 species and varieties new to science are recorded in some 40 different genera. The importance of the work lies, not only in the record of new plants, but also in the incorporation of much synonomy and bibliography from scattered publications.—J. M. GREENMAN.

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[3] HABERLANDT, G., Physiological plant anatomy, translated from the 4th German edition by Montagu Drummond. 8vo. xv+777. *figs. 291.* London: Macmillan. 1914. $6.50.

[4] BOT. GAZ. 55:402. 1913.

[5] FRYE, T. C., and RIGG, G. B., Elementary flora of the Northwest. pp. 256. New York, Cincinnati, and Chicago: American Book Co. 1914.

[6] SARGENT, CHARLES SPRAGUE, Plantae Wilsonianae. An enumeration of the woody plants collected in western China for the Arnold Arboretum of Harvard University during the years 1907, 1908, and 1910 by E. H. WILSON. Part IV. Publications of the Arnold Arboretum. no. 4, 8vo. pp. 262. Cambridge: The University Press. Issued March 24, 1914.

NOTES FOR STUDENTS

Hereditary symbiosis.—One of the most remarkable of recent botanical discoveries, that of hereditary symbiosis between bacteria and seed plants, was made independently by MIEHE and VON FABER,[7] thus adding another to the notable list of great simultaneous achievements. As early as 1894 TRIMEN noted the persistent presence of small knotlike excrescences on the leaves of certain tropical Rubiaceae of Ceylon. In 1902 ZIMMERMANN noted the constant presence of bacteria in these structures, at least in four species from Java, whereupon he referred to them as bacterial knots (*Bacterienknoten*). Since ZIMMERMANN did not take up the question of the origin of the bacterial knots, VON FABER went to Buitenzorg in 1910 to make an extended study of them. A preliminary report of his early observations was made in 1911, and a full account followed in 1912.[8]

VON FABER investigated the symbiotic relations of five species of Rubiaceae, viz., *Pavetta indica*, *P. angustifolia*, *P. lanceolata*, *P. Zimmermanniana*, and *Psychotria bacteriophila*. In the closed buds the bacteria are found in resinous masses in among the leaf primordia. As the leaves develop, the bacteria enter them through certain precociously appearing stomata and pass into intercellular spaces, Soon there is differentiated in the leaf a special tissue composed of small cells rich in chlorophyll. Between these cells there develop capacious intercellular spaces, which the bacteria occupy henceforth. By the time the bacteria have occupied these spaces, the precocious stomata through which they entered the leaf become closed. From pure cultures of the host plants it was discovered that the bacterial tissue is derived from primordia which without the presence of the bacteria develop into a secretory reservoir, in which there accumulates a resin similar to that noted above as present in the bud. It is probable that the bacteria are attracted by this resin. Careful study of every stage in the life history of the host plants showed that the bacteria are always present. They become inclosed in the ovary at flowering,

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[7] VON FABER, F. C., Über das ständige Vorkommen von Bakterien in den Blättern verschiedener Rubiaceen. Bull. Dép. Agric. Ind. Néerl. **46**: pp. 3. 1911. (See Bot. Centralbl. **119**:351. 1912.)

[8] ———, Das erbliche Zusammenleben von Bakterien und tropischen Pflanzen. Jahrb. Wiss. Bot. **51**:285–375. *figs. 7. pls. 3.* 1912.